

Elk Habit Sheet 1

Rocky Mountain elk are the most abundant large mammal in Yellowstone National Park, numbering up to 20,000 in the summer. Male elk, called bulls, have large antlers made of calcium which are shed and regrown each year. Female elk, cows, usually have one baby or calf per year.

Although widely distributed throughout Yellowstone, large concentrations are found specifically in the Lamar Valley in northeast Yellowstone. The valley is approximately 15 miles long and up to 2 miles wide, void of trees, with the Lamar River cutting a channel through glacial deposit material. The edges of the valley rise up to forests of Douglas fir, Lodgepole pine and Englemann Spruce. The predominate vegetation in the valley is big mountain sagebrush and several grass species, including Idaho fescue. The road to Cooke City, Montana follows the northern edge of the valley and is maintained year-round. In addition to elk, the area is home to wolves, reintroduced to Yellowstone in 1995, grizzly bears, bison, coyotes and other small mammals. Snowfall is abundant, but foraging opportunities for the animals exist, so a winter population of 8,000-12,000 elk was historically supported in the Lamar Valley.

By contrast the Madison River Drainage is only 7 miles long and up to 1 mile wide. The Madison River is formed by the confluence of the Firehole and Gibbon Rivers at the head of the drainage. The underlying bedrock is volcanic. The West Entrance road cuts through the valley connecting West Yellowstone, Montana and Madison Junction in Yellowstone Park. The road is closed to wheeled traffic in the winter, but is used by over-the-snow vehicles. A resident herd of 500-800 elk (historical numbers) inhabit this drainage, along with mule deer, bison, coyotes, wolves and occasional grizzly bears and other small mammals. Geothermal activity along the valley floor keep winter snow melted away from the river and hot spring areas. Some grasses are able to grow year-round in the hot spring area, and elk use this food source throughout the year.

Discussion:

1. If you were an elk, in which habitat would you choose to live and why?
2. What major differences do you notice between the two habitats?
3. What do you think the effect of predation is on the elk herds in the two habitats?

Other questions: List any other questions raised by your group.

Elk Habitat Sheet 2

In the mid 1990's, researchers began to notice changes in the population numbers of the two elk herds. The average age of elk in the Lamar Valley was approximately 16 years, with the oldest animals living 20-25 years. In the Madison Drainage valley, the average age of elk was approximately 10 years, with no elk living beyond 16 years.

Discussion:

1. What are your initial reactions to the causes of the age difference in the two habitats? List and discuss as many as you can.
2. If you were a research scientist, what investigations would you conduct to determine the cause of the differences in life span between elk in their two habitats?
3. What additional information do you need to know?

Other questions: List any other questions raised by your group.

Elk Habitat Sheet 3

In mid-January 1995, 14 wolves were reintroduced to Yellowstone National Park. These wolves were captured in Canada and placed in three 1-acre holding pens created especially for them. One of these pens was located near the Lamar Valley. The wolves were released into the wild a few months later and began to establish territories and prey on large mammals, especially elk, which make up 90% of their winter diet. In winter, a wolf pack will kill 9-14 elk per month. As of January 2008, 443 wolves live in 51 packs in the Greater Yellowstone ecosystem, with 11 packs of 171 individual living with the borders of Yellowstone National Park.

Discussion:

1. What is the impact of the reintroduction of wolves on elk in Yellowstone National Park?
2. Is this information adequate to explain the life span differences in the Lamar Valley and Madison drainage elk?
3. What additional information is needed to adequately explain the difference in life span?
4. If you were a research scientist, what investigations would you conduct to determine the effect of predation by wolves on the elk herds in these two habitats?

Other questions: List any other questions raised by your group.

Elk Habitat Sheet 4

Research from a study begun in the mid-1990s on the elk in these two habitats yielded a stark difference in the formation of jaws of elk. Skulls of elk from the Lamar Valley showed usual wear of teeth at the time of death (Elk Jaw Photo 1). The skulls of elk from the Madison drainage showed accelerated and malformed wear patterns of teeth and abnormalities in jaw development (Elk Jaw Photo 2). As a result, many Madison drainage elk died of starvation. By 2004-5, researchers also began to see a decrease in the population of the Madison drainage herd size. The historical numbers of up to 800 were now reduced to 150-200.

Discussion Questions:

1. What new evidence is presented and how does it factor in to the difference in average age of the two elk habitats?
2. What do you believe could be the cause of accelerated and malformed wear of teeth and jaws on the Madison Valley drainage elk herd?
3. If you were a research scientist, what investigations would you conduct to determine the cause of the accelerated and malformed wear patterns of the jaws?
4. What possible explanations are there for the reduced population size? List all that come to mind.
5. What additional questions does this information raise?



Elk Jaw Photo 1



Elk Jaw Photo 2

Elk Habitat Sheet 5

Researchers discovered that as the heavy snows of the Madison Valley drainage accumulated over the season, elk tended to congregate in the river valley, especially around areas of hot spring activity. Plants gathered from these areas contained extensively high concentrations of fluorine (F) and silicon dioxide (SiO_2). Silicon dioxide is created by silicon-rich volcanic rock being dissolved when it comes in contact with geothermal water. As the geothermal water comes to the surface, the dissolved SiO_2 falls out of solution, forming deposits of silicon dioxide. The SiO_2 is also in steam and can be deposited on trees, boardwalks, etc. Additionally, silicon dioxide is in the water absorbed by the roots of plants that live in the hot spring areas. Silicon dioxide is hard like rock and very abrasive. When ingested by elk, fluorine concentrates in mineral tissues such as teeth and bone. The jaws of elk living in the Madison drainage contained more than six times the levels of fluorine found in elk jaws from the Lamar Valley. These levels of fluorine become toxic to the developing teeth and jaws of young elk, resulting in uneven and/or excessively rapid teeth wear and jaw formation. Of the 74 jaws researchers collected in the Madison drainage, 78% showed the classic signs of fluoride poisoning.

1. What new evidence is presented and how does it factor in to the difference in average age of the two elk habitats?
2. What hypotheses did you have to reject as a result of this new information?
3. Does this new information adequately explain the decrease in herd population?
4. What hypotheses do you have to explain the decrease in herd size?
5. If you were a research scientist, what investigations would you conduct to determine the cause of the decrease in herd size?
6. What additional questions does this information raise?

Elk Habitat Sheet 6

Wolves primarily prey on the young and weak members of a population. Because the average age of the Madison elk herd has been reduced due to the toxic levels of fluorine and the ingestion of silicon dioxide, higher numbers of adult elk are susceptible to predation by wolves. In addition, the snowpack on the slopes adjacent to the Madison drainage are deep. Wolves have learned to force the elk away from the geothermal areas in the river drainage into the surrounding slopes where the elk get stuck in the deep snow and are easy prey.

1. What additional evidence is presented and how does it explain the reduced population in the Madison drainage elk herd?
2. As a group, discuss the complexities involved in explaining the differences between the elk in the Lamar Valley and the Madison drainage.
3. Explain how habitat plays a role in the differences between the two elk herds.